

CLAIMS

1. A jet-powered boat comprising a hull having a stern and a bottom, and an outboard water jet propulsion unit mounted to said hull, wherein said outboard water jet propulsion unit comprises:

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an engine;

an engine support structure;

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a duct having an inlet with a generally horizontal face and an outlet with a generally vertical face, said duct being supported by said engine support structure;

an impeller mounted to a generally horizontal impeller shaft which penetrates said duct, said impeller being rotatable inside said duct to impel water out said duct outlet; and

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a drive train for coupling said engine to said impeller shaft for driving said impeller shaft to rotate during engine operation.

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2. The boat as recited in claim 1, wherein said drive train comprises a generally vertical drive shaft coupled to said engine and gears for converting rotation of said generally vertical drive shaft into rotation of said generally horizontal impeller shaft.

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3. The boat as recited in claim 2, wherein said gears comprise a first bevel gear connected to said drive shaft and a second bevel gear connected to said impeller shaft, said first bevel gear meshing with said second bevel gear.

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4. The boat as recited in claim 3, further comprising a gear housing attached to said engine support structure, and first and second bearings supported by said

gear housing, said first bearing rotatably supporting said first bevel gear and said second bearing rotatably supporting said second bevel gear.

5 5. The boat as recited in claim 1, wherein said engine support structure comprises an exhaust housing having an exhaust gas passage.

6. The boat as recited in claim 5, wherein said exhaust housing comprises a pair of mounting brackets adapted for coupling with a tilt pivot tube.

10 7. The boat as recited in claim 5, wherein said duct comprises an inlet housing attached to said exhaust housing, said inlet housing comprising said duct inlet and an exhaust gas passage in fluid communication with said exhaust gas passage of said exhaust housing.

15 8. The boat as recited in claim 7, wherein said duct further comprises an outlet housing attached to said inlet housing, said stator housing comprising said duct outlet and an exhaust gas passage in fluid communication with said exhaust gas passage of said inlet housing.

20 9. The boat as recited in claim 8, wherein said outlet housing comprises a stator hub and a plurality of stator vanes, said impeller shaft being rotatably supported by a bearing housed within said stator hub.

25 10. The boat as recited in claim 4, wherein said engine support structure comprises an exhaust housing, and said duct comprises an inlet housing attached to said exhaust housing, said inlet housing comprising said duct inlet, and said gear housing and said inlet housing being integrally formed.

30 11. The boat as recited in claim 10, further comprising a thrust bracket arranged between said water jet propulsion unit and said stern of said hull, said thrust

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bracket comprising side walls which flank said exhaust housing on opposites sides thereof.

5 12. The boat as recited in claim 1, wherein said duct inlet is at a depth not lower than a lowest point of said hull bottom.

13. The boat as recited in claim 1, further comprising a steering nozzle pivotably mounted to said duct at said duct outlet, said steering nozzle being pivotable about a generally vertical axis.

10 14. A jet-powered boat comprising a hull having a stern and a bottom, and an outboard water jet propulsion unit mounted to said hull, wherein said outboard water jet propulsion unit comprises:

15 a first housing mounted to said hull stern, said first housing comprising a drive shaft passage;

an engine supported by said first housing;

a drive shaft penetrating said drive shaft passage in said first housing, one end of said drive shaft being coupled to said engine;

20 a second housing attached to and located beneath said first housing, said second housing comprising a water tunnel and a chamber which communicate via an opening in an interior wall, said water tunnel having an inlet and an outlet;

25 a gear and bearing assembly housed in said chamber of said second housing, the other end of said drive shaft being coupled to said gear and bearing assembly;

30 an impeller shaft which penetrates said opening in said interior wall and is disposed generally perpendicular to said drive shaft, one end of said impeller shaft being coupled to said gear and bearing assembly;

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an impeller mounted to said impeller shaft and rotatable within said water tunnel; and

5 a third housing attached to said second housing, said third housing comprising a flow-through passage in fluid communication with said water tunnel, said flow-through passage having an outlet.

10 15. The boat as recited in claim 14, further comprising a hub fixed within said third housing, and a bearing housed within said hub, the other end of said impeller shaft being rotatably supported by said bearing housed within said hub.

15 16. The boat as recited in claim 14, wherein said first through third housings comprises exhaust gas passages which are connected in series to discharge exhaust gases from said engine.

17. The boat as recited in claim 14, wherein said inlet of said water tunnel is at a depth not lower than a lowest point of said hull bottom.

20 18. The boat as recited in claim 14, further comprising a steering nozzle pivotably mounted to said third housing at said outlet, said steering nozzle being pivotable about a generally vertical axis.

19. An outboard water jet propulsion unit comprising:

25 an exhaust housing comprising an exhaust gas passage and a drive shaft passage;

an engine mounted on top of said exhaust housing;

30 a drive shaft penetrating said drive shaft passage in said exhaust housing, one end of said drive shaft being coupled to said engine;

an inlet/gear housing attached to and located beneath said exhaust housing, said inlet/gear housing comprising a flow-through passage and a chamber which communicate via an opening in an interior wall, said flow-through passage having an inlet and an outlet, and further comprising an exhaust gas passage in fluid communication with said exhaust gas passage of said exhaust housing;

a gear and bearing assembly housed in said chamber of said inlet/gear housing, the other end of said drive shaft being coupled to said gear and bearing assembly;

an impeller shaft which penetrates said opening in said interior wall of said inlet/gear housing, one end of said impeller shaft being coupled to said gear and bearing assembly;

an impeller mounted to said impeller shaft and rotatable within said passage;

an outlet housing attached to said inlet/gear housing, said outlet housing comprising a flow-through passage in fluid communication with said passage of said inlet/gear housing, said passage converging toward an outlet, and a bearing support structure; and

a bearing supported by said bearing support structure of said outlet housing, wherein the other end of said impeller shaft is rotatably supported by said bearing.

20. The propulsion unit as recited in claim 19, wherein said inlet of said inlet/gear housing lies in a plane which is generally parallel to said impeller shaft, and said impeller shaft is generally perpendicular to said drive shaft.

21. The propulsion unit as recited in claim 19, wherein said outlet housing comprises an exhaust gas

passage which is in fluid communication with said exhaust gas passage of said inlet/gear housing.

5 22. The propulsion unit as recited in claim 19, further comprising a steering nozzle pivotably mounted to said outlet housing for pivoting about an axis which is generally perpendicular to said impeller shaft.

23. An outboard water jet propulsion unit comprising:

10 an engine support housing comprising a drive shaft passage;

an engine mounted on top of said engine support housing;

15 a drive shaft penetrating said drive shaft passage in said engine support housing, one end of said drive shaft being coupled to said engine;

an inlet housing attached to and located beneath said engine support housing, said inlet housing comprising a passage having an inlet and an outlet;

20 a gear and bearing assembly coupled to the other end of said drive shaft;

an impeller shaft which penetrates said inlet housing, one end of said impeller shaft being coupled to said gear and bearing assembly;

25 an impeller mounted to said impeller shaft and rotatable within said passage;

30 an outlet housing attached to said inlet housing, said outlet housing comprising a flow-through passage in fluid communication with said passage of said inlet housing, said passage converging toward an outlet, and further comprising a bearing support structure; and

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a bearing supported by said bearing support structure, wherein the other end of said impeller shaft is rotatably supported by said bearing,

5 wherein said impeller shaft is generally perpendicular to said drive shaft, and said inlet of said inlet housing is disposed below said impeller shaft.

10 24. The propulsion unit as recited in claim 23, further comprising a steering nozzle pivotably mounted to said outlet housing for pivoting about an axis which is generally perpendicular to said impeller shaft.

25. An outboard water jet propulsion unit comprising:

an engine support housing;

15 an engine supported by said engine support housing;

a drive shaft having one end coupled to said engine;

20 an inlet housing attached to and located beneath said engine support housing, said inlet housing comprising a flow-through passage having an inlet and an outlet;

an impeller shaft which penetrates said inlet housing;

an impeller mounted to said impeller shaft and rotatable within said passage;

25 an outlet housing attached to said inlet housing, said outlet housing comprising a flow-through passage in fluid communication with said passage of said inlet housing, said passage of said outlet housing converging toward an outlet;

bearings for rotatably supporting said shafts;
and

gears for converting rotation of said drive shaft
into rotation of said impeller shaft,

5 wherein said impeller shaft is generally
perpendicular to said drive shaft, and said inlet of said
inlet housing is disposed below said impeller shaft.

10 26. The propulsion unit as recited in claim 25,
wherein each of said engine support housing, said inlet
housing and said outlet housing comprises a respective
exhaust gas passage, said exhaust gas passages being
connected in series.

15 27. The propulsion unit as recited in claim 25,
further comprising a gear housing which houses said gears,
said gear housing being integrally formed with said inlet
housing.

20 28. The propulsion unit as recited in claim 25,
further comprising a steering nozzle pivotably mounted to
said exit nozzle, said steering nozzle being pivotable
about an axis which is generally perpendicular to said
impeller shaft.